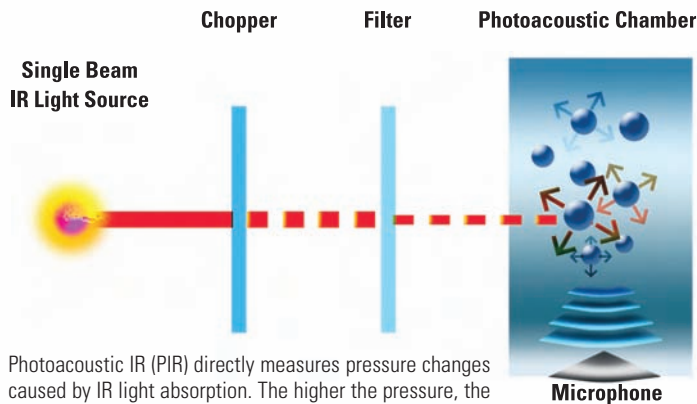


State-of-the-art technology, flexible choices for the fixed gas monitoring goals YOU set.

Choose Thermal Gas System's Photoacoustic IR for the highest level of monitoring dependability.

Because no reference gas comparisons are required, only Photoacoustic Infrared (PIR) technology provides a direct measurement of refrigerant gas concentrations. Other Non-Dispersive IR technologies are subject to "zero" baseline drift when comparing room samplings with a reference gas. PIR eliminates zero drift. With Thermal Gas System PIR instruments, "zero-is-zero."



Photoacoustic IR (PIR) directly measures pressure changes caused by IR light absorption. The higher the pressure, the greater the concentration of measured gas.

- *Proven, ultra-precise microphone enables unattended operation for longer periods of time.*
- *PIR reduces installation and maintenance costs. No need for fresh air sampling line or in-line scrubber required by other IR units.*
- *Higher operating efficiency. PIR technology eliminates downtime for frequent auto-zero processing common in other technologies.*
- *Temperature controlled, sealed sample cell in Thermal Gas PIR units eliminates effects of temperature, atmospheric pressure and humidity changes on readings.*
- *Superior signal-to-noise ratio. Highly selective PIR technology outperforms all others in trace measurement concentrations (1 ppm).*

Or, choose Haloguard CMOS Monitors for basic compliance -

The flexibility you need to cost-effectively meet standards and code requirements within budget.

“ The next best thing to your own refrigerant gas pro... go to www.thermalgas.com for a free Haloguard system configuration proposal based on... ”

- Monitoring Priorities:**
Refrigerant conservation, Occupant safety, Regulatory compliance
- Mechanical Room:**
Size & layout, Number of entrances, Airflow patterns
- Chillers:**
How many, Sizes
- Gas of Interest:**
Any refrigerant gas, Number/type of gas, Gas combinations, Oxygen depletion
- Output Requirements:**
Relay contacts, analog output, serial communications, data logging.

Or call (800) 896-2996 for a no-obligation system assessment.



THERMAL GAS *Systems* inc.

**REFRIGERANT GAS
MONITORING FOR:
MACHINE ROOMS •
REFRIGERATION
EQUIPMENT • COLD
STORAGE AREAS •
PROCESS COOLING**

Our Experience = Your Gain

With experience extending back to the 1988 Montreal Protocol, no other fixed monitoring system manufacturer can claim a greater history dedicated to the research, manufacture, sales and service of refrigerant gas monitoring systems. Today, the Thermal Gas Systems Haloguard® product brand has come to mean proven reliability worldwide - designed and constructed to withstand tough mechanical room requirements.

Personal Thermal Gas Customer Service

Our monitors are customized to meet any refrigerant gas or oxygen depletion application based on individual project goals – from stringent refrigerant conservation to code compliance. We effectively work with users at all levels of the industry: System Engineers, Mechanical Contractors, Facility Managers, Chiller Equipment Manufacturers and Distributors. You are invited to experience our personalized customer service and support. As a welcome alternative to large company bureaucracy and automated runarounds, Thermal Gas Systems customers respect our prompt and knowledgeable response to their needs.



Haloguard IR, Haloguard II/IR, and Haloguard III combine the most sensitive, highly selective Photoacoustic IR (PIR) detection with microprocessor digital control to provide the most advanced, state-of-the-art system for refrigerant gas detection. PIR technology virtually eliminates false alarms and reference sample drift (see overleaf technology overview).

All Haloguard PIR models feature...

- Three user alarms and one fault alarm.
- Seven dry contact relays enable remote event triggers - such as ventilation, remote notification and signaling systems, or interface with building management systems.
- Options include 2, 4, or 8 channel scanners for increased area coverage, analog output data with concentration reports for each sampling point, strobes and audible alarms, oxygen depletion sensor, and battery backup.
- ETL listed to applicable UL and CAN/CSA electrical safety standards.

Haloguard® IR

**Most sensitive (1ppm), highly selective
Photoacoustic infrared gas monitoring**

Highly selective single gas monitor with sensor and controller all-in-one, with 1, 2, 4, or 8 channels. Three alarms are adjustable between 10 ppm and full scale. Optionally, monitor up to 3 different gases simultaneously from up to 24 points by adding Remote IR Modules and Channel Scanners.

HALOGUARD IR SPECIFICATIONS

Electrical supply: 115-230V, 60Hz, 65W	Operating conditions: +30°F to +120° non-condensing
Fuse: 3A/240V; fast acting	Enclosure: Weight: Std: NEMA 250 20 lbs.
Output signal: Std: 7 x 10A dry contact relay Opt: RS-232/RS-485 Opt: 0-5VDC or 4-20mA analog	Opt: NEMA 4/12 25 lbs.
Sensitivity: 1 ppm	
Resolution: 1 ppm	
Response time: <1 minute	
Clearing time: <3 minutes	
Measuring range: • 0-1,000 ppm all refrigerants	

Haloguard® III

**Multi-gas, wideband PIR cost-
effective 20ppm sensitivity**

Haloguard III features wideband photoacoustic infrared (PIR) technology for monitoring up to 8 gases with sensor and controller all-in-one. Three alarms are adjustable between 50 ppm and full scale. Optionally, monitor up to 24 different gases from up to 24 points by adding Remote IR Modules and Channel Scanners.

HALOGUARD III SPECIFICATIONS

Same as Haloguard IR except:
Sensitivity: 20 ppm



Maximum accuracy & sensitivity

CMOS - Solid state technology
Cost-effective, reliable

Remote IR Module

for monitoring additional gases and/or sampling points on any Haloguard PIR monitor. Can be located up to 1000 ft. from controller.



Haloguard® II/IR

Sensitive (1ppm) & selective PIR monitoring in a modular design

Full performance Photoacoustic IR in a split architecture component system to enable separate locations within a machine room for controller and sensor components. Three alarms are adjustable between 10 ppm and full scale.

HALOGUARD II/IR SPECIFICATIONS

Same as Haloguard IR except:
Output signal:
Std: 4 x 3A dry contact relay
Opt: 4 x 0-5VDC, 0 - 10VDC analog
Enclosure: Weight:
IR Module: NEMA 4/12/13 15 lbs.
Controller: NEMA 12/13 8 lbs.

Remote Display

ASHRAE compliance for notification outside each mechanical room entrance

Couple our Remote Display Panel with any Haloguard system to cost-effectively display refrigerant concentrations, fault diagnostics, visual and audible alarms to a safe location outside the machine room.



Haloguard CMOS Fixed Gas Monitors feature two adjustable alarm levels for fault and offscale conditions. Options include: battery backup, strobe. Sensors can be located up to 300 feet from the controller.

Haloguard® II

Multi-sensor multigas plus oxygen CMOS monitoring

Multiplex up to 6 sensors of any gas type (CFC, HCFC, HFC, Ammonia or Oxygen). Dry contact relays are activated when any sensor reaches an alarm condition. Analog output for up to 4 sensors.

HALOGUARD II SPECIFICATIONS

Electrical supply: 115-230V, 50-60Hz
Output signal:
Std: 4x3A, dry contact relay
Opt: 4 x 0-5VDC analog
Accuracy: 10% full-scale
Measuring range: 0-1,000 ppm All CFC, HFC, HCFC (except R123)
0-300 ppm R123, R717 (ammonia)
0-25% Oxygen
Response time: <1 minute
Recovery time: <3 minutes

Operating conditions:
• CMOS Sensor: -20°F to +120°F non-condensing
• O2 Sensor: +40°F to +110°F non-condensing
• Controller: 0°F to +120°F non-condensing
Materials:
• Sensor: PVC and PP filter
• Controller: NEMA 12/13
Weight: 8 lbs. (add 4 lbs. for optional battery backup).

Technology ASHRAE compliance



...n levels between 10% and 100% of scale, and two additional alarms
...probe and audible alarms. Solid state electronics ensure dependability.

Haloguard®

Single-Sensor CMOS monitoring

Four alarm relays are standard, analog outputs are available to interface with building management systems or other remote devices.

HALOGUARD SPECIFICATIONS

Electrical supply: 115-230V, 50-60Hz

Output signal:

Std: 4x3A dry contact relay

Opt: 0-10VDC or 4-20mA analog

Accuracy: 10% full-scale

Measuring range:

0-1000 ppm All CFC, HFC, HCFC (except R123)

0-300 ppm R123

Response time: <1 minute

Recovery time: <3 minutes

Operating conditions:

- Sensor: -20°F to +110°F non-condensing

- Controller: 0°F to +120°F non-condensing

Materials:

- Controller: NEMA 4

- Sensor: PVC and PP filter

Weight: 6 lbs. (Add 4 lbs. for optional battery backup).

Ancillary Equipment

Oxyguard®

Economical, 24-Hour Oxygen Depletion Monitor utilizes an electro-chemical cell for virtually maintenance-free monitoring for oxygen depletion in any number of sensitive environments. Two alarm levels with LED, local audible, and strobe alarm with remote notification to BMS, ventilation or other systems. Remote sensor with 6' cable and DIN plug. Optional: remote sensor extension cable, battery backup, gas test kit, lockable enclosure.



SCBA

NIOSH/MSHA approved North Model 832 SCBA is a low cost and worry free unit. It is an open circuit, compressed air, self-contained breathing apparatus designed specifically for use in non-fire emergency situations, for egress from a contaminated area, or for clean up of chemical/toxic spills and accidents.



Calibration & Demo Kits

Span Gas Calibration Kit is available for demonstrating new PIR units, calibrating them after the first 12 months of operation, or calibrating them for a different gas type. The kit includes: a 103L calibrated refrigerant gas canister, regulator, gas sampling bag, tubing and fittings, microprocessor or digital calibrator, carrying case and instructions. Additional gas canisters can be ordered separately.

CMOS Unit Demonstration Kit designed to demonstrate the response of the unit to the gas of interest.

Helpful information for machine room fixed gas monitoring...

TECHNOLOGY

Infrared (IR) technology is based on the absorption of a specific wavelength of IR light by a gas molecule.

Unlike other IR-based technologies, **Photoacoustic IR (PIR)** is a direct measurement technology that does not rely on reference sampling. This eliminates inaccuracies when reference gas zero drifts due to changes in temperature and pressure, aging IR light, and sample cell contamination. PIR systems measure pulsating changes in pressure that occur after IR light is absorbed by the refrigerant molecule. Specific gases can be selectively monitored by narrowly filtering the IR light, thereby avoiding any absorption when no gas is present.

CMOS technology is based on a conductivity change when sensitized metal oxides are exposed to refrigerant gases. While CMOS systems can perform adequately to satisfy the safety requirements of many refrigerants, IR technology is recommended for toxic applications, conservation efforts, or cross contamination potential.

Sensitivity

Both CMOS and IR technologies deliver adequate sensitivity to meet safety standards that call for an alarm, remote notification, and ventilation at the TLV-TWA (AEL-TWA). The sensitivity of a highly selective IR instrument is 1 ppm; Wideband multi-gas IR is 20 ppm; CMOS instrument sensitivity is 30-40 ppm for HCFC's, 40-50 ppm for HFC's, and 60-80 ppm for CFC's. Example: 1 lb. of refrigerant will evaporate to occupy 3-4 cubic feet of volume, thus raising the concentration of a 30,000-40,000-cubic-foot room to 100 ppm.

ASHRAE 15-2004: CODE Excerpts

Section 8.11.2.1 Refrigerating Machinery Room, General Requirements.

Each refrigerating machinery room shall contain a detector, located in an area where refrigerant from a leak will concentrate, that actuates an alarm and mechanical ventilation in accordance with 8.11.4 at a value not greater than the corresponding TLV-TWA (or toxicity measure consistent therewith). The alarm shall announce visual and audible alarms inside the refrigerating machinery room and outside each entrance to the refrigerating machinery room.

Section 8.11.6 Combustion Equipment - ...Combustion Equipment shall not be installed in the same machinery room with refrigerants-containing equipment except under one of the following conditions:

(a) combustion air is ducted from outside the machinery room and sealed in such a manner as to prevent any refrigerant leakage from entering the combustion chamber, or

(b) a refrigerant detector, conforming to 8.11.2.1, is employed to automatically shut down the combustion process in the event of refrigerant leakage.

11.7 Responsibility for Operation and Emergency Shutdown. The emergency procedures shall forbid entry into the refrigerating machinery room when the refrigerant alarm required by 8.11.2.1 has been activated except by persons provided with the appropriate respiratory and other protective equipment and trained in accordance with jurisdictional requirements.

Gas Selectivity

The selectivity of a monitor is its ability to differentiate refrigerants or interfering vapors from other areas. Consider a highly selective Haloguard IR or II/IR monitor, for example, when both Group A1 and non-Group A1 refrigerants are present, or when other halocarbons, volatile hydrocarbons, or extraneous chemicals (like cleaning products) may also be present.

Number of Sensors/Sensing Points & Placement

How many sensors do you need? Rule of thumb: one sensor or sample point for each 20,000-30,000 cubic feet of room volume, or one sensor fewer than the number of chillers, whichever is less; provided that there is one sensor for each refrigerant in the room. For continuous drafts, locate a sensor downstream from the last potential leak source. Smoke tubes help determine airflow patterns. Adding points near each potential leak source enhances gas conservation goals. Since refrigerants are heavier than air, sensors are typically located about 18" off the floor, and in low-lying areas (like a stairwell).

Remote Notification

ASHRAE 15 requires audible and visual alarms to be present inside the mechanical room, and outside each entrance to it. An optional, Remote Display Panel provides gas concentration and diagnostic information at a safe place outside the mechanical room.

EXPOSURE LIMITS

GAS	TLV-TWA ¹	STEL-C ²	WEEL ³	PEL ⁴	RCL ⁵	Group
R-11	.	1,000	.	1,000	1,100	A1
R-12	1,000	.	.	1,000	18,000	A1
R-22	1,000	.	.	1,000	25,000	A1
R-123	50**	.	50	30**	9,100**	B1
R-134a	1,000**	.	1000	1,000**	50,000**	A1
R-500	1,000	.	.	1,000**	29,000**	A1
R-502	1,000	.	.	1,000**	35,000**	A1

1) ACGIH (American Conference of Government Industrial Hygienists) - TLV-TWA = 8hr./day 40 hr./wk avg.

2) ACGIH - Short Term Exposure Limit Ceiling. Should not exceed 3-5 times the TWA for more than 30 min./day.

3) AIHA - Workplace Environment Exposure Level

4) OSHA - Permitted Exposure Limit

5) ASHRAE - Refrigerant Concentration Level for Occupied Space

**Exposure limits are pending. Given values were determined in a consistent manner.

THERMAL GAS *Systems* inc.

Haloguard® Monitors Since 1988

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